

CLAIMS

1. Optical device (12) adapted particularly for the observation of specimens on a support (4) in the field of biology, comprising a front surface located on the side of the specimen or the like, to be observed and a rear surface oriented toward acquisition means (18, 19) of an image or a user,

characterized in that it comprises a combination of four aligned lenses and in that the lenses are disposed in the following order from front to rear: a plano-convex lens (28), a divergent meniscal lens (30), a plano-concave lens (32) and a bi-convex lens (44), the plano-concave lens (32) and plano-convex lens (48) respectively being such as each to have on the one hand a substantially flat surface and on the other hand a respective concave or convex surface.

2. Optical device according to claim 1, characterized in that the lenses are assembled as two doublets, a front doublet with the plano-convex lens (28) and a divergent meniscal lens (30) and a rear doublet with the plano-concave lens (32) and the biconvex lens (34).

3. Optical device according to claim 2, characterized in that the rear doublet is a cemented doublet for which the front radius of curvature of the biconvex lens (34) corresponds to the radius of curvature of the rear spherical surface of the plano-concave lens (32), and in that the two lenses of each doublet are made of materials having different indices of refraction.

4. Optical device according to one of claims 2 or 3, characterized in that the front doublet is an uncemented doublet.

5 5. Optical device according to one of claims 2 or 3, characterized in that the front doublet is an uncemented doublet at the center but cemented about its periphery.

10 6. Optical device according to one of claims 1 to 5, characterized in that the two lenses (30, 32) located at the center of the optical device have an index of refraction greater than the index of refraction of the lenses (28, 34) located at the outside of the optical device (12).

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7. Optical device according to one of claims 1 to 6, characterized in that the plano-convex lens (28) has a rear surface whose radius of curvature is comprised between -30 and -32.5 mm and a front substantially flat surface, a diameter comprised between 20 and 25 mm as well as the thickness at the center comprised between 2 and 4 mm, in that the divergent meniscal lens (30) has a rear surface whose radius of curvature is comprised between -22.5 and -25 mm and a front surface whose radius of curvature is comprised between -17 and -18.5 mm, a diameter substantially equal to the diameter of the plano-convex lens as well as a thickness at the center comprised between 1 and 2 mm, in that the plano-concave lens (32) has a rear surface whose radius of curvature corresponds to the radius of curvature of the front surface of the biconvex lens (34), a diameter substantially identical to the diameter of the biconvex lens (34) as well as a thickness at the center

comprised between 1 and 3.5 mm, in that the rear biconvex lens (34) has a rear surface whose radius of curvature is comprised between -28 and -30 mm and a front surface whose radius of curvature is comprised between 28 and 30 mm, a diameter comprised between 22 and 26 mm as well as a thickness at the center comprised between 4 and 7 mm, and in that the distance between the flat surfaces of the plano-concave lens (32) and the plano-convex lens (28) is comprised between 20 and 25 mm,

all the values indicated for this device being adapted to be multiplied by a same coefficient to obtain a similar device by homothetic transformation.

8. Optical device according to one of claims 1 to 7, characterized in that it moreover comprises electroluminescent diodes (36) disposed in a crown about its axis as well as a Fresnel lens (38) interposed between the diodes (36) and the specimen, or the like, to be observed.

9. Observation or analysis device for one or several specimens disposed on a support (4), particularly a plate, comprising an observation objective (12) for at least one portion of a specimen along an observation axis (26) from an observation surface of the support, a positioning plate of the supported adapted to ensure relative movement between the support (4) and the axis of observation (26) in a plane perpendicular to the axis of observation, whilst leaving free the vertical movement, illumination means (14) of at least a portion of the specimen and acquisition means (18) of an image at the objective outlet,

characterized in that the observation objective comprises an optical device (12) according to one of claims 1 to 8.

5 10. Observation device according to claim 9, characterized in that the acquisition means of an image comprise an objective with fixed focal length as the focusing optics (19).

10 11. Observation device according to claim 9, characterized in that the acquisition means of an image comprise a zoom as the focusing optics (19).

15 12. Observation device according to one of claims 9 to 11, characterized in that it comprises behind the optical device a filtration device having variable spectral properties.

20 13. Observation device according to one of claims 9 to 12, characterized in that it comprises on the path of the fluorescence light a dichroic mirror returning a portion of this light towards second observation means.